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EXAMINER	
VU, TUAN A	
ART UNIT	**PAPER NUMBER**
2193	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/614,618	NAMJOSHI, KEDAR SHARADCHANDRA	
	Examiner	Art Unit	
	Tuan A. Vu	2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *9/22/03* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to the application filed 7/7/2003.

Claims 1-26 have been submitted for examination.

Specification

2. 35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are:

'*This completeness result does not ... AX(p) v AX(¬p) ... tuple (Q U {tt,ff},q^,δ,F) ....for every a-successor*' (Specs, pg. 4, middle)

'*The model checking problem is to determine ... it is shown that M satisfies A if and only if player I ... is said to be feasible*' (Specs, pg. 5, bottom, to pg. 6, top);

'*The ATS M x A is abstracted ... R((s,q),(s',q'))).... (t,q) to q*' (Specs, pg. 7, middle);

'*Consistency: For each q ∈ Q,[Φ_q => ... Parity condition: ({q1 }, {q0, q2, q3, q4 })*' (Specs, pg. 8-9); and following is a snapshot of an example of convoluted expressions for which no explanation is given for the symbols or operators used (see Specs, pg. 11, middle)

For an abstract AND state (t, q),

$$R'((t,q),g,(t',q')) \Leftarrow (\exists s : s\xi_q t : (\exists s' : s'\xi_q t' : R((s,q),(s',q')) \wedge g \equiv \eta_{q'}(s') \lhd_q \eta_q(s)))$$

For an abstract choice state (t, q),

$$R'((t,q),g,(t',q')) \Rightarrow \in((t,q),(t',q') \neq 0 \wedge (\forall s : s\xi_q t \wedge s \in \in((t,q),(t',q')) : (\exists s' : s'\xi_{q'} t' : R((s,q),(s',q')) \wedge g \equiv \eta_{q'}(s') \lhd_q \eta_q(s)))$$

It is noted that the subject matter deemed essential for understanding the claimed invention revolves around the use of mathematical expressions including sophisticated symbolism and representations in form of uncommon mathematical or logical operators. And the description to explain on the meaning of these symbolic elements in terms of more decipherable and common phraseology is observed as being far inadequate for one skill in the art to comprehend the semantic or legend underlying or pertaining to those expressions. The formulating based of all of the special symbols, variables (or variances thereof) or logical operators appear to be presented with the assumption that a reader has already ample background to construe the meaning of each of the elements therein. That is, there is not sufficient explanation for each and every one of those logical operators, the symbols, or variables or variances thereof (e.g. the combination of variables with special subscripts or superscripts in the above snapshot), in order to yield a sound starting point or basis as to how these expressions represent a mechanism or algorithm that can be understood. The disclosure is marred with two main deficiencies: (i) the lack of consistency in accompanying each element of the equations with a decent legend or explanation therefor to put forth a rationale, and (ii) the disjoint relationship or non-connectivity between the equations mentioned. If one equation recites 10 symbols or logical operators, only a portion of those appear to have a short description, leaving out the rest unexplained, particularly the mathematical or logical operators, most of which perceived rather meaningful not to one ordinary skill in the art (emphasis here) but only to the experts in the field or domain utilizing those expressions, and adapted to the related symbolism. Further, the disclosure appears to compound the automaton subject matter being expressed in equations with depicting of further equations, most of which apparently not taking under

consideration (or make use of) the meaning of the parameters belonging the one another; making the recital of additional equations or logical expressions much harder to follow, rendering any rationale (expressed via a sequence of seemingly disjoint equations) hard to follow, e.g. highly complex mathematic/logic equations without elaborate legend of their internal parts -- the likes of those mentioned above as examples -- and presented without a perceivable continuity in order to convey an unity on the novel aspect thus endeavored. Another example of lack of unity in the subject being conveyed is that there is recital of theorems and material requiring proof (Specs, pg. 8, 9, 12 – proving of *completeness*, *predicate ranking* shown via theorems); and no clear essence whatsoever can be extracted from the subject being presented via discussion about possible proofs of some theorems because in order for an application to be implemented factual data --beyond the state of theorem abstraction --are to be put together in a perceivable step actions, each involving application level entities, like computer, file, media or tangible processing engine. If it is understood that the present Invention is about an improved algorithm-based method whereby a software program can be optimized, the meaning of each of the above algorithmic/mathematical expressions should be compliant with the requirements of USC 112, first paragraph requiring a clear, precise and non-verbose content or description, all of which expressions having to be supported by application level data manipulation via tangible utilities. As it is, the compounding of the disclosure such that it is replete with complex expressions without support of a more common language to clarify on the significance of each element recited therein amount to verbose and unclear phraseology. Thus, the essential subject matter is not being conveyed to enable understanding in accordance with USC 112, 1st para, and as a whole the disclosure has to be revised; e.g. wherever a complex expression (e.g. one cited

above) representing a part of the subject matter deemed essential, such expression should be accompanied by a textual elaboration which would include for each and all element recited, a adequate, clear and pertinent description. Besides, if the subject matter is essential, the use of external publication source would have to be explicitly inserted, not merely incorporated via the referencing means known as 'incorporated by reference' (refer to CFR §1.57)

3. The incorporation of 'essential' material (in the specification) by reference to an unpublished U.S. application, foreign application or patent, or to a publication is improper. Applicant is required to amend the disclosure to include the material incorporated by reference, if the material is relied upon to overcome any objection, rejection, or other requirement imposed by the Office. The amendment must be accompanied by a statement executed by the applicant, or a practitioner representing the applicant, stating that the material being inserted is the material previously incorporated by reference and that the amendment contains no new matter. 37 CFR §1.57 (f).

For example, the mentioning of *Jutla*'s 'Tree Automata, mu-Calculus and Determinacy' as being *incorporated by reference* appears to refer to automata and states essential for the understanding of the components of the ATA (see Specs, pg. 4, bottom). Likewise, the mentioning of *Kesten/Pnueli*,'Verification by Augmented Finitary Abstraction'; or of *Uribe*, 'Abstraction-based Deductive-algorithmic Verfication of Reactive Systems'(Specs, pg. 10, bottom, pg. 11, top) appears to support the essence of the predicate selection with ranking concept. Essential subject matter eligible for incorporation by reference can only come from a related U.S. Patent, or U.S. Patent Publication, of all which cannot themselves include further incorporation by reference of said essential matter. For essential matter (see further example:

Ball et al., 'Relative Completeness of Abstraction Refinement for Software Model Design', Specs, pg. 13, top --to show how *completeness* is defined) the reference to a mere publication does not fall into the category of references regulated by the CFR §1.57, making the above incorporation(s) improper.

4. The disclosure is objected to under 37 CFR 1.71, as being so incomprehensible as to almost preclude a reasonable search of the prior art by the examiner. For example, the following sequence of steps are not understood:

For an abstract AND state (t, q),

$$R'((t,q),g,(t',q')) \Leftarrow$$
$$(\exists s : s\xi_q t : (\exists s' : s'\xi_{q'} t' : R((s,q),(s',q')) \wedge g \equiv \eta_{q'}(s') \lhd_{\varphi} \eta_q(s)))$$

For an abstract choice state (t, q),

$$R'((t,q),g,(t',q')) \Rightarrow \in((t,q),(t',q') \neq 0 \wedge (\forall s : s\xi_q t \wedge s \in \in((t,q),(t',q')):$$
$$(\exists s' : s'\xi_{q'} t' : R((s,q),(s',q')) \wedge g \equiv \eta_{q'}(s') \lhd_{\varphi} \eta_q(s)))$$

The disclosure expects one reader to understand the elements recited inside a series of finite state transition algorithms (or predicated/abstracted semantics) and their underlying semantic that appears to come from some external publication as mentioned above; hence not providing sufficient explicit teaching about the components being used inside the above complex equations; most of which demanding knowledge of an expert in the field of theorem and proof. If understanding the above algorithm entails deep understanding of every symbol use, essential subject matter has to be provided not incorporated from a publication as stipulated in the CFR §1.57; which the Specifications does not do properly.

As set forth above, the complex nature of the invention subject matter is not clearly, and properly put forth in the Specifications to enable one skill in the art to have sufficient basic grasp

on any novel aspect being claimed. The specifications amounts to juxtapositions of complex mathematical/logic symbolism with insufficient legend as to the content thereof, and the incorporation of external publication does not help enlighten the subject matter underlying the apparently indecipherable formulas or expressions being presented throughout the discussion of algorithmic equations in the Specifications; and last but not least, there is no clear dependency or continuity in use between the concepts (or semantics of the components) used in a previous equations (or math expressions) and the following embodiments of the same concepts in other equations, rendering the relationship required of the constituents of the algorithmic approach if any, unclear; i.e. there is not sufficient consistency or unity in conveying of a rationale to support a common endeavor. What is disclosed is a sequence of algorithms (or predicated/abstracted semantics) with insufficient descriptive elaboration as to the content thereof, all of which algorithmic instances virtually presented in a distinct context, thus seemingly not connected in a meaningful manner as to their dependency as to follow through with, to derive from one another. For instance, the *completeness* and *choice predicate* – Specs, pg. 10-12 -- analysis to support the *OR states set* or *AND states set* -- Specs , pg. 4-9 – can only be comprehended via an additional teaching coming from a publication, *inter alia*, by Kesten and Pnueli, among others, and the lecture notes by Ball, in LNCS, and this deferring or referring does not establish a purposeful continuity and unity of teachings from one feature to another; nor does it put forth the essence of the invention in a self-sufficient and explicit layout. The mentioning of proof and theorem (Specs, pg. 8, 9, 12) does not enable one skill in the art to be apprised on the applicability or extent of the novelty aspect of the invention in terms of concrete data being transformed by specific means and tangible means at an application level to produce a useful real world data

because demonstration about or proposed concepts related to attempts of proving theorems cannot be transformed in said application results. Moreover, the Specs lack in explaining the nature of often very uncommon logical/math operators. An example of unexplained math operators would be 'M X A'. This is perceived as a cross product (a vector product) of a program against an automaton. There is no acceptable description as to how a program M being crossed (or interacted) with the components of a automaton A can yield a product (M x A) or abstract program (see Specs pg. 2, top) in which transitions are in a weakening states.

The Specifications has to be amended to overcome the above deficiencies. Broadest interpretation of the subject matter being disclosed will be based upon in order to attempt to construe the features or equivalent thereof of the Application as disclosed.

If the understanding of the subject matter relies so much on the publications referred by means of 'incorporated by reference' it is strongly urged that Applicant submit excerpts of the pertinent portions of those publications needed for that effect; and at the same time correct the issue of incorporating such 'essential subject matter' by the above means.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1-26 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

> The Federal Circuit has recently applied the practical application test in determining whether the claimed subject matter is statutory under 35 U.S.C. § 101. The practical application test requires that a " useful, concrete, and tangible result" be accomplished. An "abstract idea" when practically applied is eligible for a patent. As a consequence, an invention, which is eligible for patenting under 35 U.S.C. § 101, is in the "useful arts" when it is a machine, manufacture, process or composition of matter, which produces a

> concrete, tangible, and useful result. The test for practical application is thus to determine whether the claimed invention produces a "useful, concrete and tangible result".

Specifically, claim 1 recites a method of computing an abstract program with reduced states from an automaton f, and a set of abstract values. The end result appears to be abstract program having reduced states obtained from other abstract entities. A abstract program represented by computing state values cannot be perceived as tangible real-world data, absent any description or elaboration as to the manner in which these reduced states are contained, embodied as or persisted into. From the specifications, the automaton states appear to be abstract concepts observed from a finite state analysis discussion, without associated therewith any tangible support to format these concepts in a persistent basis. The claim amounts to generating abstract and unstable entities (states of a computing process being volatile) and is rejected for not sufficiently conveying that the result produced belong to an application level data in terms of a concrete, tangible, and useful result, as required by the Practical Application Test requirement. Claims 1-13 for not reciting sufficient teaching to convey a Practical Application leading to a tangible result are rejected as non-statutory subject matter.

Claim 14 recites a computer system for producing the same abstract program of claim 1; hence by virtue of the unstable and non-tangible nature of the states in a automata processing, the program thus produced amounts to mere abstracted data not persisted in any perceivable form. The lack of tangible result fails to fulfill the Practical Application requirement; and claims 14-26 for not providing further teaching as to creating a tangible useful set of outputs are rejected for leading to non-statutory subject matter.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 1 recites forming a product of program M and a property f expressed as an automaton f. The Specifications does not provide teaching about a product of program M expressed as an automaton f. The recited abstract program with reduced states amounts to a internal state of a computer program; and the Specifications fail to disclose any embodiment that actually generates such abstract set of reduced states in terms of an application or engineering-level programmatic product. Most of the analyses observed in the content of the Specifications are a form of Mathematical/Logical type of material with some predicates, proof preambles, formulations of algorithmic approaches and theorems intermingled with symbolism expressing variety of such algorithms (or predicated/abstracted semantics). Hence, the (reduced) states perceived from the recited 'computing' (computing an abstract program) remain abstract concepts integral to the above theoretical analysis; and this is not clearly set forth an enablement (enabling feature) as to how these theoretical conceptual symbols can by implemented (made use of) via support of a real-world application, lacking implementation details in the disclosure so as to reasonably convey that these Math/Logic analysis are supported by tangible executing means in a manner which would yield useful, tangible data actualizing the above analysis or theorems, into yielding of specific, substantial and credible form and repeatable amount of real-world data,

such form or amount satisfying the requirement of USC §101 as set forth above in the non-statutory rejection.

Further, the disclosed invention does not sufficiently teach a product being formed from a program *M* and a time property *f* in order to convey that the time property f is being expressed by an automaton f (as recited). The mentioning of Jutla to provide more insight about the states acceptance for a set F being a partition of Q in the LTS M satisfying a automaton property related to a player strategy in the Specifications, at pages 4-5, does not establish a remote analogy to a time property and a particular automaton associated with it. The inventor does not appear to possess this limitation at the time the invention was made, namely teachings or explicit and substantial specifics about how an automaton is expressing one time property.

Claims 2-13 fails to provide teaching as to how the recited abstract transitions and states can be enabled by means of application level implementation to realize a useful set of result deemed statutory as per the USC §101 requirement. The realm construed as automata science cannot yield practical data when there is not sufficient teaching (e.g. engineering realm of implementation) as to enabling abstract scientific concepts via (application-level) transformation to turn into useful data in the realm of practice.

Likewise, claim 14 does not convey that the recited abstract program can be obtained via any real-world application or implementing utility deemed substantial, tangible and specific as perceived from the Specifications in order for one person by reading the specifications to make use of the content therein to realize some useful application result as set forth above. There is substantial leap from claiming a computer with stored program to accomplish the abstract program when there is no teaching of intermediate (application-level) implementation steps -- in

the claim or in the Specifications -- to really lay out the engineering approach converting the theoretical analysis results from the disclosure so to actualize those via application means in order to generate USC 101 type of useful real-world output. The Disclosure remains descriptive in terms of science level of teachings, and since there no application level type of implementation being disclosed, one skill in the art can not turn what is construed as science per se into application or industrial outcome/data via what appears to be an absence in engineering teaching. The claim is therefore not enabled by the Specifications.

Further against claim 14, the invention does not teach a product being formed from a time property *f* being expressed as an automaton. The inventor does not appear to possess this f property expressed as automaton f at the time the invention was made.

Claims 15-26 are likewise rejected.

The limitations will be treated with the broadest interpretation permitted.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 1-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites 'forming a product of ... M and said branching ... property f, expressed as an automaton f'. There is inconsistency in more than one object being represented by a same 'f' and the Specifications does not seem to be consistent with this nomenclature; further, the forming of a program and a time property f is not clear based from the way the 'M X A' product is depicted in the specifications.

Claim 5 recites S', S(bar) and 'X' and only S and Q are explained leaving out S(bar) and 'X';

Claim 6 does not provide explanation of the symbols $<a> q_1$ and of $\delta(q,true)$ and of the 'V' symbol.

Likewise, claims 7-9 recites symbols for which only a few are provided with some definition, but some will have none: e.g. $s\xi t$, ξ ; and there is semantic confusion about the recital of *I* and *I'* representing a same entity (*initial states*); and about *individual state s* versus *abstract state (t, q^)*.

Claim 10-11 recites an acronym for which there is no definition.

Claim 14 recites forming a product and a time property being expressed as automaton f; and this f automaton limitation is not disclosed in the specification to make time property 'f' an automaton 'f' as recited.

Claims 18-24 are also rejected for exhibiting the similar deficiencies as claims 5-11.

The claims 2-13 for depending on a rejected base claim are also rejected.

Claims 15-26 are rejected for depending of a rejected base claim.

The above limitations will be treated with the broadest interpretation of one skill in the art treating the claims in the context that at best applies to a FSM state machine

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-11, and 14-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Alur et al., USPN: 6,324,496 (hereinafter Alur).

As per claim 1, Alur discloses a method for reducing a program, M, that preserves at least one branching time property, f, comprising the steps of:

forming a product of said program, M and said branching time property, f, (e.g. *branching-Time requirements, Kriple structure M satisfies the formula* Φ – col. 10, lines 23-58) expressed as an automaton, f (e.g. *finite state machines, structure K* – col. 3, line 50 to col. 4, line 6; Fig. 4, 6);

obtaining an abstract domain containing a set of abstract values to generalize possible states of said program and abstract relations that relate said program states to said abstract domain (e.g. *it is possible ... satisfies ... satisfy the formula...* - col. 12, lines 50-53; Fig. 11; col. 9, lines 1-10);

computing an abstract program with a reduced number of states and an altered version of said branching time property, f, using said product (e.g. *reduction* – col. 9, lines 36-52; col. 10, lines 23-51 – Note: dynamic resolving of path direction in terms of algorithm requirements to yield a reduction in the cycling of paths of a K structure reads on reduction including altering of a branching property; i.e. every time a requirement is satisfied indicating a altering of path or branching with regard to before considering that requirements – see Fig. 9, 11; col. 11, line 47 to col. 12, line 22).

As per claims 2-3, Alur discloses performing an automated program check (verifying - col. 10, lines 23-58; *satisfy* – Fig. 9, 11); wherein said automated program check is a model checking step (see Alur: Abstract, Title).

As per claim 4, Alur discloses wherein said automated program check is performed for an altered branching time property (corresponding citation in claim 1).

As per claim 5, Alur discloses the step of defining a set of states, S', in said abstract program as S'={overscore (S)} X Q, where S is a set of states in said program, M, and Q is a finite set of states (see Fig. 4, 6, 7).

As per claim 6, Alur discloses wherein OR states in said set of states, S', are those states where δ(q, *true*) has the form q1 √ q2, and all other states are AND states, where q are individual states and δ is a transition relation between states (see Fig. 4, 6, 7 – Note: branching with multi edges exit reads on OR states – see col. 13, line 61 to col. 14, line 15; *set of propositions* – col. 10, lines 23-58).

As per claim 7, Alur discloses wherein an abstract state (t, q^) is in a subset of initial states, I', of the abstract program if there exists s Є I for which s. ξ(q^)}t, where s is an individual state, I is a subset of initial states, I, of the program, M, and ξ(q^) is one of said abstract relations (e.g. initial labeling of *step 902* – Fig. 9 – Note: processing FSM and incrementally add more nodes to FSM based on the initial states reads on abstract state being a subset of initial state – see Fig. 10, 11).

As per claim 8, Alur discloses for an abstract AND state (t, q), the transition ((t, q); (t',q')) is in an abstract transition relation, R', if there exists a concrete state (s, q) and a successor (s',q') that are related to (t, q); (t',q') respectively (e.g. col. 10, lines 60-65; Fig. 4,5,6 – Note: all states that are not OR states reads on AND states for which there can be one edge going to them from/to a upper/successor node – e.g. Fig. 11 for *TRUE state 1106, 1108*).

As per claim 9, Alur discloses wherein for an abstract OR state (t, q), the transition ((t, q); (t',q')) is in an abstract transition relation, R', only if for every (s, q) which is related to (t, q), there exists a successor (s', q') which is related to (t', q') (Note: see claim 6 in view of the successor or ancestor concept perceived in the FSM with multi-path branching in view of Fig. 4,5,6; e.g. *YES, NO, MAYBE* – col. 12, line 34 to col. 13, line 44).

As per claim 10, Alur discloses wherein said product ATS M X A is abstracted by weakening said transition relations at AND states (e.g. col. 10, lines 60-65 – Note: assumed a single exit to be a simple U relation is weakening the rigidness of a AND state).

As per claim 11, Alur discloses wherein said product ATS M X A is abstracted by strengthening said transition relations at OR states (*set of propositions* – col. 10, lines 23-58 – Note: applying requirements to derive the appropriate K Structure relation for a requirements reads on strengthening the undefiniteness of a multi-path branching).

As per claim 14, Alur discloses a system for reducing a program, M, that preserves at least one branching time property, f, comprising: a memory; and a processor operatively coupled to said memory, said processor configured to:

form a product of said program and said branching time property;

obtain an abstract domain containing a set of abstract values to generalize possible states of said program and abstract relations that relate said program states to said abstract domain;

compute an abstract program with a reduced number of states and an altered version of said branching time property using said product;

all of which limitations having been addressed in claim 1 above.

As per claims 15-24, these claims correspond to the subject matter of claims 2-11, respectively, hence will incorporate the rejections as set forth therein.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 12, 13, and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alur et al., USPN: 6,324,496 (Alur) and further in view of Alur et al, 'Alternating-time Temporal Logic', *Foundations of Computer Science*, FOCS 1997, Proceedings of the 38th Annual Symposium, pp. 100-107 (hereinafter Alur2).

As per claims 12-13, Alur does not specifically disclose the step of obtaining one or more rank functions and employing said one or more rank functions in an abstract transition relation, R'; nor does Alur explicitly disclose the step of obtaining one or more choice predicates and employing said one or more rank functions in an abstract transition relation, R'.

Alur discloses formula based on a predefined set of propositions (see Fig. 9) and derive possible true states from whether a FSM entry satisfy a formula (see 10); hence has taught a selection of formulas for which some requirements are satisfied by the FSM execution, which can be analogized to selection of predicates. The imparting of a value, a weigth or rank to edge or path in multi-path reacheability issues selection for a branch decision-making was a known concept at the time the invention was made. In a model checking endeavor with alternating-time logic using propositions analogous to Alur, **Alur2** discloses resolving a branching temporal

logics with quantification of paths, i.e. giving weight to the paths like a ranking function (see *«A» function* - chp. 2, pg. 102 to pg. 104) so that it would be obvious for one skill in the art based on the teachings by Alur (see Fig. 9,10) to support a formula of a proposition selection by Alur (to select possible predicates) by including the techniques of **Alur2** by which path quantifiers functions can add another ranking dimensions to the reacheability decision of Alur 's method because according to **Alur2**, the use of alternating-temporal approach with quantification of complex paths implicating two possible outcomes for a deterministic machine logic can reach at a certain state, such that in open systems of the natural language like game type of moves, the system moves and the environment moves can be specified via the quantification function as well as a possible true state can be reached (see Altar 2, pg. 1, Abstract).

As per claims 25-26, these claims correspond to the subject matter of claims 12-13, respectively, hence will incorporate the rejections as set forth therein.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan A Vu whose telephone number is (272) 272-3735. The examiner can normally be reached on 8AM-4:30PM/Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571)272-3719.

The fax phone number for the organization where this application or proceeding is assigned is (571) 273-3735 (for non-official correspondence - please consult Examiner before using) or 571-273-8300 (for official correspondence) or redirected to customer service at 571-272-3609.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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